

WHAT IS CLAIMED IS:

1. An electrical submersible pump runner for use in a pad-type hydrodynamic bearing/runner assembly, the runner comprising:

 a core layer; and

 a wear layer affixed to the core layer.
2. The runner of claim 1, further comprising at least one porous bronze layer affixed to the core layer, wherein the wear layer is affixed to the core layer by being affixed to the at least one porous bronze layer.
3. The runner of claim 1, wherein the wear layer is a first polymer layer, and

 wherein the runner further comprises a second polymer layer affixed to the core layer on

 a side of the runner opposite the first polymer layer.
4. The runner of claim 3, further comprising first and second porous bronze layers affixed to opposite sides of the core layer to which respective ones of the first and second polymer layers are affixed.
5. The runner of claim 1, wherein the core layer comprises mild steel.
6. The runner of claim 1, wherein the core layer comprises copper electroplating.
7. The runner of claim 1, wherein the wear layer comprises polyimide.

8. The runner of claim 1, wherein the core layer defines a recess in which the wear layer is disposed.

9. The runner of claim 8, wherein the recess comprises an undercut.

10. The runner of claim 8, wherein the wear layer protrudes from the recess above the core layer.

11. The runner of claim 3, wherein the core layer defines a passageway through which the first polymer layer and the second polymer layer are connected.

12. The runner of claim 11, wherein the core layer defines a recess in which the first polymer layer is disposed.

13. The runner of claim 12, wherein the recess comprises an undercut.

14. The runner of claim 11, further comprising a porous bronze layer affixed to the core layer on the side of the runner opposite the first polymer layer, wherein the second polymer layer is affixed to the core layer by being affixed to the porous bronze layer.

15. A bearing and runner assembly for use in a submersible pump system, the assembly comprising:

a bearing comprising at least one bearing pad; and

a runner, the runner comprising a first layer comprising a core material and a second layer comprising a polymer coating affixed to the first layer, wherein the at least one bearing pad is adapted to contact at least a portion of the second layer.

16. The assembly of claim 15, wherein the polymer coating comprises polyimide.

17. The assembly of claim 15, further comprising a porous bronze layer affixed to the first layer, wherein the second layer is affixed to the first layer by being affixed to the porous bronze layer.

18. The assembly of claim 15, wherein the bearing comprises uncoated hardened steel.

19. A runner for use in a pad-type hydrodynamic bearing/runner assembly, the runner comprising:

a core layer; and

a polymer layer affixed to the core layer,

wherein the polymer layer forms a plurality of spaced bearing pads to provide a bearing that rotates with the runner.

20. The runner of claim 19, wherein the core layer defines recesses into which the polymer layer is molded.

21. The runner of claim 20, wherein the recesses comprise undercuts.

22. A bearing and runner assembly for use in a submersible pump system comprising:
- a bearing comprising at least one bearing pad; and
 - a runner comprising a polymer coating affixed to a first side of the runner and individual bearing pads on a side of the runner opposite the first side.
23. The assembly of claim 22, wherein the runner defines passageways through which the polymer coating is connected to the individual bearing pads.
24. The assembly of claim 22, wherein the runner defines recesses in which the individual bearing pads are disposed, and wherein the recesses comprise undercuts.
25. The assembly of claim 22, wherein the runner further comprises a porous bronze layer to which the polymer coating is affixed.
26. The assembly of claim 22, wherein the bearing comprises uncoated hardened steel.
27. A submersible pump system comprising:
- a multi-stage centrifugal pump; and
 - a motor coupled to the multi-stage centrifugal pump, the motor comprising:
 - a shaft coupled to the multi-stage centrifugal pump,
 - a rotor having a thrust bearing, and

a first runner affixed to the shaft, the runner comprising a first core layer and a first wear layer affixed to the first core layer, wherein the first wear layer faces the thrust bearing.

28. The system of claim 27, further comprising a rotary gas separator and a seal section, wherein the shaft extends through the seal section, and wherein the seal section comprises:

an up-thrust plate,

a down-thrust bearing, and

a second runner affixed to the shaft and disposed between the up-thrust plate and the down-thrust bearing, wherein the second runner comprises:

a second core layer,

a second wear layer affixed to a first side of the second runner facing the up-thrust plate, and

a third wear layer affixed to a second side of the second runner facing the down-thrust bearing.

29. The system of claim 27, wherein the first core layer comprises mild steel, the first wear layer comprises a polymer, and the thrust bearing comprises uncoated hardened steel.

30. The system of claim 28, wherein the second runner defines recesses in which the second wear layer is disposed.

31. The system of claim 28, wherein the second layer comprises individual bearing pads.

32. The system of claim 28, wherein the second runner defines a passageway through which the second wear layer is connected to the third wear layer.

33. A method for overhauling a submersible pump system having a runner removably attached to a shaft, the method comprising:

removing the runner from the shaft;

removing a surface layer of the runner to expose a core substrate;

applying a wear layer to the core substrate; and

reattaching the runner to the shaft.

34. The method of claim 33, wherein the surface layer comprises a worn polymer coating.

35. The method of claim 33, wherein the wear layer comprises an engineered plastic.

36. The method of claim 33, wherein applying a wear layer to the core substrate comprises:

applying a porous bronze layer to the core substrate; and

applying a polymer layer to the porous bronze layer.

37. The method of claim 36, wherein applying the porous bronze layer comprises sintering the porous bronze layer.

38. The method of claim 36, wherein applying the polymer layer comprises injection molding the polymer layer into porous areas of the porous bronze layer.

39. The method of claim 36, wherein applying the polymer layer comprises injection molding the polymer layer into recesses of the runner to form individual bearing pads.

40. The method of claim 36, wherein applying the polymer layer comprises injection molding the polymer layer on opposite sides of the runner connected by passageways through the runner.